**Career Academy Integrated Unit Plan**

**Academy Name: \_\_\_HEMS\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** **School: \_\_\_\_\_\_\_\_Atlantic \_\_\_\_\_\_\_\_**

**Date Created: \_\_\_\_\_Jun 8, 2011 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Created by: Clements/McDowall**

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| Integrated Unit Plan Title: Energy Content of Alternative Fuels |
| Courses to integrate: Chemistry and Horticulture 3 |
| Grade Level: 11th |
| Timeline & Duration: Two weeks |

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| Unit Summary: In this unit we will learn the following:  The nature of chemical energy (stored as the potential energy of chemical bonds)  Exothermic and endothermic reactions  Measurement of heat released by a reaction  Energy forecasts for the future  Impact on the environment of use of traditional fuels  Alternative sources of energy  Agricultural products useful as possible fuel sources  Making ethanol  Petroleum  Origin  Known reserves worldwide  Geopolitics of petroleum  Products derived from petroleum  Use of petroleum in the U.S.A.  Criteria for selecting a fuel source for an intended use  Making bio-diesel II  Evaluating alternative vs. traditional fuels  Measuring heat content of foods and fuels (calorimetry)  Watering plants to avoid freeze damage (heat of fusion of ice) |
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| **Overview of Activities/Lessons per Course** | | | | |
| Course | Chemistry | Horticulture 3 |  |  |
| Activity/Lesson | Specific Heat | Making Bio-Diesel |  |  |
| Activity/Lesson | Heat Content of Fuels | Distillation |  |  |
|  | Testing Bio-Diesel | Testing Bio-Diesel |  |  |

**Lesson Instructions for Chemistry:**

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| **Standards (Performance Tasks or Course Frameworks or Sunshine State Standards ):** SC.912.N.4.1; SC.912.N.4.2; MA.912.S.1.2; MA.912.S.3.2.  **Rigor & Relevance (quadrant): 3** |
| **Instructions to Teacher:** Do specific heat of a metal lab to orient students to that concept. Hort teacher will continue with heat of fusion of ice lab. (Relates to glaciers and ice caps melting, etc.) |
| **Instructions to Students:** Research topics assigned by teachers in textbooks and outside media for background on need to solve problems, impact on society if problems are not solved, alternatives available, criteria, etc. |
| **Instructions for Student Accommodations:** Students can use data researched by teacher to develop memory aids, briefing materials, and as a guide to use during experimentation. |
| **Assessment for Activity:** Student presentation by lab group/team for the results of their team’s measurement of the heat content of their assigned possible alternative “fuel.” |
| **Approximate Length of Time for Activity:** Two weeks |
| **Materials Needed:**  CBL and temperature probe, TI-83 or better, ringstand, empty soda can, stopwatch, graduated cylinder, paperclips (fuel/food stand), matches,Styrofoam cup calorimeter, ice, metal sample. Methanol, sodium hydroxide, two-liter bottles, stoppers, plastic tubing, small air compressor, funnel, filter paper, cooking oil. |
| **Resources Needed:** internet connectivity to do research and prepare briefing materials |
| Attachments: |

**Lesson Instructions for Horticulture 3:**

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| 23.0Identify emerging technologies in the horticulture industry--The student will be able to:  This standard supports the following Next Generation Sunshine State Standards SC.912.L.16.1, 2; SC.912.L.17.15, 17; MA.912.A.5.l, 4; MA.912.P.1.1  23.01 Investigate DNA and genetics applications in horticulture including the theory of probability.   * 1. Evaluate advances in biotechnology that impact horticulture. (e.g. transgenic crops, biological controls, micro propagation etc.). |
| **Instructions to Teacher:** Review concepts presented about global warming, use of fossil fuels, geopolitics of petroleum, alternative fuels, agricultural products suitable for food, fuel and fibers, the water cycle, and technology’s role in helping solve public policy problems. Obtain safe working environment for experiments and review safety procedures for these processes.  As introduction, present Biotechnology PPT. Prepare and distribute student handout. |
| **Instructions to Students:**  Prepare for class by reviewing issues and possible solutions. Review available resources for preparing final briefing of experimental results. Consider how plants convert sunlight into energy and could we humans somehow exploit that process. Read handout on Biomass project. |
| **Instructions for Student Accommodations:** More time / more structure may be necessary to enable all students to achieve satisfactory results. Prepare handouts as required for less able students. Highlight key words and instructions in lab handout beforehand. |
| **Assessment for Activity:** Production of distilled water or alcohol, depending on experiment. Tests should be positive for ethanol. Heat of fusion experiment should yield results within 15% of accepted value. Students will also submit a short research paper presenting their thoughts on the need to utilize biofuels. |
| **Approximate Length of Time for Activity:** Two weeks for entire unit. One class period for each lab activity. One day for discussion and analysis of results. Two days for development and sharing of results to class by each lab team. |
| **Materials Needed:** CBL and temperature probe, TI-83 or better, ringstand, empty soda can, stopwatch, graduated cylinder, paperclips (fuel/food stand), matches,Styrofoam cup calorimeter, ice, metal sample. Hotplate, flask, stopper, J-shaped glass tubing, samples of mixtures to distill, crushed ice, beakers. |
| **Resources Needed:** Case study on Global Warming, computers running PowerPoint, internet access. |
| Attachments/Resources Biofuel Lessons: <http://www1.eere.energy.gov/biomass/abcs_biofuels.html#prod>  Biotechnology PPT (teacher created)  Pages 10-17 of biomass lesson below.  <http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf> |